



Correlates of Lifetime Physical Activity in Young Women

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ABSTRACT

This study retrospectively examined physical activity patterns across three specific age periods (childhood, teenage, and young adulthood) in a cross sectional sample of young Caucasian undergraduate women (N=44). All women (mean age=22.27±3.14 years) completed questionnaire packets assessing transtheoretical model of behavior change constructs. Additionally, each woman completed a detailed historical physical activity oral interview with the investigator. Physical activity decreased significantly across all age groups. Physical activity during ages 13 to 18 and 19 years and older, counterconditioning (i.e., substituting physical activity for other behaviors), self-liberation (i.e., making a commitment to adopt an active lifestyle), self-reevaluation (i.e., recognizing the personal importance of physical activity in one's life), reinforcement management (i.e., rewards associated with physical activity), physical activity during ages 6 to 12 years, and dramatic relief (i.e., experiencing negative emotions associated with physical inactivity) had the strongest relationship with current physical activity participation. Cons (i.e., costs associated with physical activity participation) were negatively correlated with current physical activity patterns. Results suggest a need to identify additional correlates and mediators of physical activity participation in this population.

Sedentary lifestyle permeates the majority of developed countries, including the United States. Regular physical activity affords many health benefits associated with reduced risk of chronic ailments such as coronary heart disease; stroke; noninsulin dependent diabetes mellitus; colon and breast cancer; obesity; and osteoporosis (U.S. Department of Health and Human Services [USDHHS]). Physical inactivity is recognized along with cigarette smoking, elevated cholesterol, and hypertension as a major independent risk factor for the development of cardiovascular disease (American Heart Association, 1999).

Despite the documented benefits of exercise in enhancing health and decreasing the risk of chronic disease, the prevalence of physical activity among American adults increased only slightly from 24.3% in 1990 to 25.4% in 1998 ("Physical activity trends," 2001). Rates of physical activity fall well below current national objectives, and women remain less active than men across all age and ethnic groups (Crespo, Ainsworth, Keteyian, Heath, & Smit, 1999; Dishman & Buckworth, 1996). By age 21, only 30% of women report participating in vigorous physical activity on a regular basis (National Institutes of Health [NIH],

1996). Results from the National College Health Risk Behavior Survey (Douglas et al., 1997) indicated that women aged 18–24

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years engaged in vigorous physical activity much less frequently than did men aged 18–24 years, 35.3% versus 48.9%. In four large studies conducted among college students, women were less likely to engage in any type of physical activity than men (Calfas, Sallis, Lovato, & Campbell, 1994; Pinto & Marcus, 1995; Wallace & Buckworth, 2001; Wallace, Buckworth, Kirby, & Sherman, 2000).

Because 50% of individuals who initiate an exercise program drop out within 6 months (Dishman, 1994), health professionals are faced with a major challenge in motivating individuals to adopt and maintain an active lifestyle. Several theoretical frameworks and models have been used to explain physical activity behavior. Over the past decade, Marcus (Marcus, Pinto, Simkin, Audrain, & Taylor, 1994; Marcus, Rakowski, & Rossi, 1992; Marcus, Rossi, Selby, Niaura, & Abrams, 1992; Marcus, Selby, Niaura, & Rossi, 1992; Marcus & Simkin, 1993; Nigg & Courneya, 1998; Wallace & Buckworth, 2001) and others have successfully applied the transtheoretical model (TTM) of behavior change to exercise. TTM describes intentional health behavior adoption and maintenance as a process occurring over time as a function of motivation and behavioral history.

Core constructs of the TTM are stage of change, self-efficacy, decisional balance, and processes of change (Marcus et al., 1994). The stages of exercise behavior change are defined as *precontemplation* (individuals are inactive and do not intend to begin exercising within the next 6 months), *contemplation* (individuals are inactive and are considering initiating exercise within the next 6 months), *preparation* (individuals exercise on an irregular basis, but intend to become more active within the next month), *action* (individuals have engaged in regular exercise for less than <6 months), and *maintenance* (individuals have engaged in regular exercise for ≥6 months). Stage of change is the most frequently applied construct of the TTM across health behavior research (e.g., physical activity, smoking cessation, weight loss, substance-abuse cessation).

Self-efficacy is one's perceived confidence in the ability to successfully carry out a behavior. It is also situation specific and may vary in relation to personal circumstances (i.e., major life event). Exercise self-efficacy has been studied extensively as a psychosocial determinant of both exercise adoption and maintenance (McAuley & Blissner, 2000).

Decisional balance relates to the pros (benefits) and cons (costs) of the behavior as it relates to the individual and significant others (Janus & Mann, 1977). For exercise, examples of pros include psychological (e.g., stress coping mechanism) and health (e.g., improved physical condition). Time constraints and inclement weather are example of cons. Research indicates that generally pros increase and cons decrease across the stages of exercise behavior (Prochaska & Marcus, 1994).

Processes of change are overt and covert activities that individuals utilize to modify behavior (Prochaska & DiClemente, 1983; Prochaska, DiClemente, & Norcross, 1992) (see Table 1). There are 10 processes of change associated with exercise behavior, which are grouped into two high-order factors representing cognitive (information is obtained by an individual's own actions) and behavioral (information is obtained from environmental events) strategies (Marcus, Rossi, et al., 1992). For exercise, cognitive processes have been found to peak in the action stage, and behavioral processes have been shown to steadily increase from preparation to action, at which point they stabilize (Marcus et al., 1994; Nigg & Courneya, 1998).

Exploring lifetime trends and psychological determinants of physical activity is important in furthering our understanding of adoption and maintenance of physical activity behavior into adulthood. Therefore, the purpose of this study was to retrospectively examine physical activity patterns across the life span in a cross-sectional sample of young women. The objectives of this study were to (1) describe physical activity participation across three age periods and (2) identify personal and TTM constructs correlated with

current physical activity.

METHODS

Design

Through posted flyers and word-of-mouth at the university where this research was conducted, 44 undergraduate Caucasian women between 19 and 30 years of age were recruited to participate in this study. The Human Subjects Institutional Review board at the university where this research was conducted approved this study protocol. The investigator gave an explanation of the study to each participant and assurance of confidentiality and anonymity. All women provided written informed consent prior to any testing procedures.

Procedures

On arrival at the testing laboratory, subjects completed a self-administered written questionnaire packet assessing TTM constructs. The investigator then measured height and weight. Height was assessed with a wall-mounted stadiometer, and weight was measured on a double beam balance scale with subjects wearing no shoes and light clothing. Body mass index (BMI) was calculated as weight(kg)/height(m²). Lastly, women completed an oral physical activity interview (described in detail in the Oral Interview section) administered by the investigator, which took about 20–25 minutes to complete.

Written questionnaires were validated during a field test administered to 20 undergraduate women several months prior to data collection. The purpose of the field test was to determine clarity and suitability of the questionnaires. Minor revisions (e.g., organization, bold lettering) were made based on their feedback, and no one partaking in the field test served as a subject in the study.

Reliability of the decisional balance and processes of change scales were established in prior research studies examining determinants of physical activity in a college population (Wallace & Buckworth, 2001; Wallace et al., 2000). Extensive reliability measures have been established for the ex-



ercise self-efficacy scale and oral physical activity questionnaires used in this study (described in following section).

Instrumentation

Written Questionnaires

Exercise self-efficacy was measured using the 6-item scale developed by Kim and colleagues (Kim, Horan, & Gendler, 1991). Subjects reported their confidence from *not at all confident* (0) to *very confident* (100) to the following statement, "If it were recommended that you do any of the following THIS WEEK, how confident or certain would you be that you could (e.g., do exercises even though they are difficult)?" The sum of the six items was totaled and divided by six to compute overall self-efficacy. Horan, Kim, Gendler, Froman, and Patel (1998) reported a Cronbach's alpha (α) of 0.90 for this scale, whereas in this study it was 0.97.

Decisional balance was measured with the 16-item questionnaire (10 pros and 6 cons) developed by Marcus, Rakowski, et al. (1992). Subjects indicated, on a 5-point Likert-type scale (ranging from 1, *not at all important* to 5, *extremely important*), how important each statement was in regard to

their decision to exercise or not. Marcus, Rakowski, et al. (1992) reported an internal consistency of 0.95 for the pro items and 0.79 for the con items. In this study internal consistency for the pro variable was 0.93 and 0.76 for the con variable.

Processes of change were evaluated using the 40-item questionnaire developed by Marcus, Rossi, et al (1992). The questionnaire includes 4 items for each of the 10 distinct processes of change. Individuals were asked to recall the past month and rate how frequently each of the processes was used on a 5-point Likert-type scale (ranging from 1, *never* to 5, *repeatedly*). Marcus, Rossi, et al. (1992) reported alpha levels of 0.62 to 0.89. In this study internal consistency ranged from 0.69 to 0.88.

Oral Interview

Historical physical activity was assessed with the Historical Leisure Questionnaire (Kriska, 1997a; Kriska et al., 1990). Women were provided with a comprehensive list of common physical activities (e.g., walking, bicycling, hunting, volleyball) to prompt their memory when recalling activities they participated in throughout their life. Physical activity behavior was examined retro-

spectively during three specific age periods: childhood or kindergarten to sixth grade (ages 6 to 12 years), teens or junior and high school (13 to 18 years), and young adulthood (19 up to 29 years). The number of years calculated for each woman during young adulthood varied. For example, the number of years in this age period would be calculated as follows for a 23 year old: 23-19-1 (past year)=3 years. Number of years the activity was performed during each age period; number of months per year that the activity was performed; and average number of hours per week the activity was performed was estimated for each age period. Total MET (metabolic equivalent unit) hours per week (MET-hr/wk) were estimated for each age period. Validity for this questionnaire was evaluated against a global physical activity index (0.38), whereas a 3-week test-retest reliability of 0.93 was reported (Kriska, 1997a).

Current habitual physical activity (i.e., past 12 months) was assessed using the Modifiable Activity Questionnaire (Kriska, 1997b; Kriska & Bennett, 1992). This tool measures specific leisure activities the individual participated in over the past year.

Table 1. Processes of Change for Physical Activity

Process of Change	Application
Cognitive	
Consciousness raising	Seeking new information about physical activity
Dramatic relief	Experiencing and expressing negative emotions associated with physical inactivity
Environmental reevaluation	Recognizing the impact of the unhealthy behavior (sedentary lifestyle) or healthy behavior (regular physical activity participation) on one's proximal social and physical environment
Social liberation	Seeking to help others adopt a physically active lifestyle
Self reevaluation	Recognizing the importance of a physical activity to one's personal identity
Behavioral	
Helping relationships	Seeking social support for physical activity from others
Reinforcement management	Rewarding oneself or being rewarded by others for making changes to adopt an active lifestyle
Self-liberation	Making a strong commitment to adopt or maintain an active lifestyle
Stimulus control	Removing cues to engage in sedentary behavior and adding cues to engage in physical activity
Counterconditioning	Substituting physical activity for other behaviors (e.g., individual will spend walk after dinner instead of watching television)



Total months, average number of times per month, and average number of minutes per session were recorded for each distinct activity. Total MET-hr/wk was estimated for the preceding 12 months. Validity for this questionnaire was evaluated against an activity sensor monitor ($r=0.27-0.88$), and a 3-week test-retest reliability of 0.89 was found (Kriska, 1997b).

Statistical Analyses

The Statistical Package for the Social Sciences (SPSS+) for Windows Version 10.0 (SPSS Inc., 1989-1999) was used for statistical analyses. Alpha (α) was set at 0.05 *a priori*. Descriptive statistics (means, standard deviations, frequencies, and percentages) were performed. Repeated measures analysis of variance (ANOVA) was used to identify changes in physical activity across the three age periods. Pearson product moment correlations were used to examine the relationship between current and past physical activity behavior (MET-hr/wk), personal characteristics, and TTM constructs.

RESULTS

The demographic profile of the sample ($N=44$) was as follows: mean age was 22.27 ($SD=3.14$; range 19–30) years, mean height was 1.63 ($SD=0.08$) meters, body weight averaged 62.67 ($SD=14.23$) kg, and mean body mass index (BMI) was 23.06 ($SD=4.68$).

A steep decline in MET-hr/wk was observed from childhood (6 to 12 years) through early adulthood ($F[2,42]=5.11$, $p<.05$). Women reported 63.51 ± 64.38 MET-hr/wk during ages 6 to 12 years, 49.84 ± 45.75 MET-hr/wk during ages 13 to 18 years, and 41.98 ± 41.60 MET-hr/wk 19 up to 29 years (see Figure). Repeated measures ANOVA showed that the largest differences in MET-hr/wk occurred from ages 6 to 12 years to 13 to 18 years ($p<.01$).

The most common physical activities differed as a function of age period (see Table 2). Swimming and bicycling were the most popular activities from ages 6–12 years. Despite the popularity of bicycling during the youngest age period, it did not appear as on the list again in subsequent age

Table 2. Five Most Common Physical Activities Across Age Periods: Percentage of Women Reporting Participation

Lifetime Physical Activities		
6 to 12 years (%)	13 to 18 years (%)	19+ years (%)
1. Swimming (65.9)	1. Jogging (59.1)	1. Jogging (51.9)
2. Bicycling (61.4)	2. Volleyball (40.9)	2. Weight Training (48.1)
3. Jump Rope (25.0)	3. Swimming (38.6)	3. Walking (37.3)
3. Rollerskating (25.0)	3. Weight Training (38.6)	4. Volleyball (29.6)
5. Basketball (22.7)	3. Basketball (38.6)	5. Aerobics (25.9)

Notes. The number of years calculated for each woman during young adulthood (19+YRS) varied. For example, the number of years in this age period would be calculated as follows for a 23 year old: $23-19-1$ (current year)=3 years.

Table 3. Significant Zero-Order Correlations (r) between TTM Constructs and Lifetime Physical Activity, with MET Hours per Week of Current Physical Activity (MET-hr/wk)

Variable	Current MET-hr/wk r
Physical activity during ages 13-18 years	.59**
Physical activity during ages 19+ years	.53*
Counterconditioning	.44*
Self-liberation	.38*
Self-reevaluation	.38*
Reinforcement management	.35*
Physical activity during ages 6-12 years	.32*
Dramatic relief	.30*
Cons	-.34*

* $p<.05$; ** $p<.01$.

periods. Jogging remained the most common activity from ages 13 years and beyond. Walking became increasingly more popular from ages 19 up to 29 years to current activity.

Table 3 contains data on significant univariate associations between TTM variables, lifetime physical activity indices, and current MET-hr/wk. Five of the 10 processes of change were significantly correlated with current MET-hr/wk. Three behavioral (self liberation [$r=.38$, $p<.05$], counterconditioning [$r=.44$, $p<.05$], and reinforcement management [$r=.35$, $p<.05$]) and two cognitive (dramatic relief [$r=.30$, $p<.05$] and self reevaluation [$r=.38$, $p<.05$]) processes of

change were positively correlated with current MET-hr/wk. Cons ($r=-.34$, $p<.05$) were negatively correlated with MET-hr/wk. All age periods were positively correlated with current MET-hr/wk, with MET-hr/wk during 13 to 18 years ($r=.59$, $p<.01$) having the strongest association of all the variables.

DISCUSSION

The purpose of this study was to retrospectively examine physical activity across three age periods in a cross-sectional sample of young women. Significant decreases were observed in physical activity as age increased. Physical activity patterns during the teenage years had the strongest correla-



Figure 1: Lifetime Physical Activity Patterns

Note: The number of years calculated for each woman during young adulthood (19+YRS) varied. For example, the number of years in this age period would be calculated as follows for a 23 year old: 23-19-1 (past year)=3 years.

tion with current physical activity (MET-hr/wk).

The assessment of past physical activity is difficult; however, a comprehensive measure was employed. As noted in Figure 1, physical activity decreased significantly over the life span, which has been consistently documented in the literature (USDHHS, 1996). The steepest declines in physical activity occurred during adolescence (ages 15 to 18) and young adulthood (ages 20 to 25) (Stephens, Jacobs, & White, 1985). By age 21, only 30% of women report participating in vigorous physical activity on a regular basis (NIH, 1996). Nationally, the prevalence of high school students who were physically active >20 minutes in daily physical education (PE) classes decreased from 34.2% in 1991 to 21.7% in 1997, although PE enrollment remained unchanged (Lowry, Wechsler, Kann, & Collins, 2001). Support for these findings in the current data suggests the need to encourage girls to remain active during their teenage years.

Physical activity patterns appear to evolve from a group setting to individualized activities as age increases. During childhood (6 to 12 years) activities were less structured, and most considered it play and not exercise. Many of the activities appeared across the remaining age groups and were performed on an individual basis, with the

exception of basketball and volleyball. Notably, there was very little difference in the top five activities from ages 19 up to 29 years and current activity. This finding may indicate that by the time a woman reaches her early twenties the types of activities she elects to participate in do not change. Jogging, walking, and weight training were the most common activities in which women currently reported participating. Results from national health-related surveys demonstrate that walking is the activity of choice among women aged 18 years and older (USDHHS, 1996). It is not surprising that jogging and walking are popular activities because they can be done on an individual basis and can be relatively easily incorporated into one's schedule.

Several TTM constructs were related to current physical activity participation (MET-hr/wk). On a univariate basis, counterconditioning had the strongest relationship with current physical activity than the other five significant processes of change. This finding implies that as individuals become more active, they are able to substitute sedentary behaviors more easily with physical activity. Self-liberation also was related significantly to current MET-hr/wk, demonstrating that more active individuals make a commitment to exercise. These data suggest that active women feel more confident (i.e., self reevaluation) in their ability to exercise and reward themselves for exercising (i.e., reinforcement management) than do women who are less active. The health benefits associated with an active lifestyle (i.e., dramatic relief) may serve as a motivator to keep women active. It would be valuable for intervention developers to focus on these processes of change when designing programs for young women.

Not surprisingly, cons were negatively associated with current MET-hr/wk. Women who perceived greater costs associated with physical activity were less active. In this sample, pros were not significantly correlated with current MET-hr/wk. This finding is not consistent to other studies (Marcus, Rossi, et al., 1992; Nigg & Courneya,

1998; Wallace et al., 2001) and needs to be explored in future investigations.

The findings from this study have implications for further understanding correlates of physical activity in early adulthood. Clearly, there is a need to better understand factors that contribute to the sharp decline in activity in the late teenage years. Based on the results of this study, it is imperative to provide adolescents and young teenagers with the opportunity to participate in lifelong activities. It is equally important to encourage the creation of intervention programs that focus on motivating individuals to participate in non-competitive activities such as walking, jogging, recreational swimming. Women should also be made aware of the long-term health benefits associated with both moderate and vigorous activities.

In interpreting the findings of this study, several limitations need to be considered. First, the sample size was relatively small and cross-sectional in nature. However, women completed a detailed historical physical activity assessment, which is not always feasible in large epidemiological studies. Accuracy of recall is a potential threat to any study that is retrospective in nature. Study participants were well-educated volunteers, which may limit generalizability of results. Finally, using volunteers as research subjects affects external validity of results.

In summary, physical activity behavior as a teenager was a very strong predictor of current MET-hr/wk. Based on the findings of this study, greater emphasis should be placed on developing and disseminating to young women appropriate intervention materials promoting a physically active lifestyle. Future research should focus on conducting longitudinal investigations on women starting in early adolescence. There is a great need to identify additional determinants and moderators of physical activity participation in this population.

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